Waves

8-6 The student will demonstrate an understanding of the properties and behaviors of waves. (Physical Science)

8-6.7 Explain how the absorption and reflection of light waves by various materials result in the human perception of color.
Taxonomy level: 2.7-B Understand Conceptual Understanding

Previous/Future knowledge: Students have been introduced to the concept of color (4-5.2) and absorption and reflection of light (4-5.3) in 4th grade. Students have not been introduced to concept of the human perception of color in previous grades. Indicator 8-6.4 also relates color to the wave behaviors of reflection and absorption. Students will further develop the concepts of reflection and interference of light waves in Physical Science (PS-7.6).

It is essential for students to know that the absorption and reflection of light waves by various materials results in human perception of color as follows:

- Most materials absorb light of some frequencies and reflect the rest.
- If a material absorbs a certain frequency of light, that frequency will not be reflected, so its color will not be perceived by the observer.
- If the material does not absorb a certain frequency of light, that frequency will be reflected, so its color will be perceived by the observer.
- If all colors of light are reflected by a material, it will appear white. If all colors of light are absorbed by a material, it will appear black.
- The color that we see depends on (1) the color of light that is shined on the object and (2) the color of light that is reflected by the object. For example, if an object reflects red wavelengths and absorbs all others, the object will appear red in color.
- *Color filters* allow only certain colors of light to pass/transmit through them; they absorb or reflect all other colors. For example, a blue filter only transmits blue light. Objects seen through a blue filter will look blue if the objects reflect blue; objects of other colors will appear black because the other color wavelengths are being absorbed by the filter.

It is not essential for students to know which frequencies of light are perceived as which colors. The mixing of primary colors of light or of primary pigments is also not essential.

Assessment Guidelines:
The objective of this indicator is to *explain* how the absorption and reflection of light waves by various materials result in the human perception of color; therefore, the primary focus of assessment should be to develop a cause-and-effect model that depicts absorption and reflection of light resulting in certain colors being seen. However, appropriate assessment should also require students to *recall* that light is made up of various frequencies that relate to the color perceived by humans; *interpret* a diagram of how colored materials reflect or absorb light; *infer* what is being reflected and what is being absorbed by a colored material; *summarize* the process by which light is absorbed or reflected by various materials; or *exemplify* of light being absorbed or reflected by various materials.